②

DTIC FILF COPY

RESEARCH ON MULTIPARAMETRIC STOCHASTIC PROCESSES

Final Report

DTIC
SELECTED
FEB 1 7 1989
D

D

by

EUGENE WONG

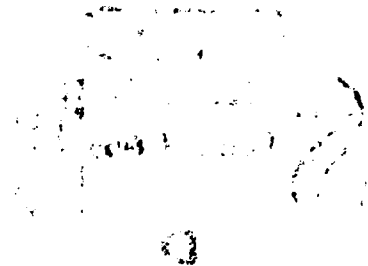August 15, 1985 to October 14, 1988

for

U. S. Army Research Office

Contract DAAG29-85-K-0223

ELECTRONICS RESEARCH LABORATORY

College of Engineering
University of California, Berkeley
94720

89 2 16 015

THE VIEW, OPINIONS, AND/OR FINDINGS CONTAINED IN THIS REPORT ARE THOSE OF THE AUTHOR(S) AND SHOULD NOT BE CONSTRUED AS AN OFFI-CIAL DEPARTMENT OF THE ARMY POSITION, POLICY, OR DECISION, UNLESS SO DESIGNATED BY OTHER DOCUMENTATION.

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified		1b. RESTRICTIVE MARKINGS			
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited.			
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S) ARO 23158.2-MA			
6a. NAME OF PERFORMING ORGANIZATION Electronics Research Lab.	6b. OFFICE SYMBOL (If applicable) N/A	7a. NAME OF MONITORING ORGANIZATION U. S. Army Research Office			
6c. ADDRESS (City, State, and ZIP Code) University of California Berkeley, CA 94720		7b. ADDRESS (City, State, and ZIP Code) P. O. Box 12211 Research Triangle Park, NC 27709-2211			
8a. NAME OF FUNDING / SPONSORING ORGANIZATION U. S. Army Research Office	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER DAAG29-85-K-0223			
8c. ADDRESS (City, State, and ZIP Code) P. O. Box 12211 Research Triangle Park, NC 27709-2211		10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

Research on Multiparametric Stochastic Processes — Unclassified

12. PERSONAL AUTHOR(S)

Eugene Wong

13a. TYPE OF REPORT Final	13b. TIME COVERED FROM 8/15/85 TO 10/14/88	14. DATE OF REPORT (Year, Month, Day) 1/15/89	15. PAGE COUNT

16. SUPPLEMENTARY NOTATION The view, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

17.	COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

> The principal accomplishments of this research project are in two areas: (a) the introduction of stochastic differential forms, and the application of this concept to the study of multidimensional martingales and Markov Processes; and (b) the development of a family of algorithms and techniques for representing and processing geometric shapes.

Martingales are the natural result of filtering and estimation of signals corrupted by noise. Markov processes, on the other hand, are models of signals and noise that lead to simple processing algorithms. For higher dimensional signals and noise such as images, these concepts are considerably more complex and lead naturally to generalized processes and vector fields that require a new framework. We have established such a framework in the form of stochastic differential forms. The basic results are reported in [1], and applications are reported in [2,3].

(See back)

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR   83 APR edition may be used until exhausted.   SECURITY CLASSIFICATION OF THIS PAGE
All other editions are obsolete.

A second body of results concerns the representation and processing of graphical and pictorial information. Two major concepts were developed in this connection. First, a novel data structure, called arc-tree, for representing continuous curves was introduced [4]. This structure is designed to achieve highly efficient operations such as intersection and point location. Second, representing polygons in "dual space" was explored. This involves representing convex polygons as the intersection of half-planes, and general polygons as a sum of convex polygons. Some of algorithm developed [5] are the most efficient known to date.

(KR)

1. E. Wong and M. Zakai, "Multiparameter Martingale Differential Forms," Prob. Th. and Rel. Fields, 74 (1987) 429–453.

2. E. Wong and M. Zakai, "Isotropic Gauss-Markov Currents," accepted by Prob. Th. and Rel. Fields.

3. E. Wong, "Multiparameter Martingales and Markov Processes," 4th Bad Honnef Conference on Stochastic Differential Systems, June 20-24, 1988, West Germany.

4. O. Gunther and E. Wong, "The Arc Tree: An Approximation Scheme to Represent Arbitrary Curved Shapes," submitted to J. of Computer Vision, Graphics and Image Processing.

5. O. Gunther and E. Wong, "A Dual Space Representation for Geometric Data," Proc. 1987 VLDB Conference, Brighton, England, September 1-4, 1987.

Accesion For		
NTIS CRA&I	☑	
DTIC TAB	☐	
Unannounced	☐	
Justification		
By		
Distribution /		
Availability Codes		
Dist	Avail and / or Special	
A-1		